

# UNPUBLISHED PRELIMINARY DATA

Semi-Annual Status Report  
for  
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The experiment mentioned in previous reports has now been completed. In an effort to study the carcinogenic potential of high energy protons, the experiment and the results were:

Thirty-two female, Sprague-Dawley rats were exposed, 4 at a time, in a tube 12 inches long with a diameter of  $1\frac{1}{2}$  inches, to a total of either  $10^{10}$  or  $4 \times 10^{10}$  2.2 Gev protons, as measured over the frontal area of the tube, on the 42nd day of age. Twenty-four littermates were exposed to 400 R of  $\text{Co}^{60}$ , while 20 littermates served as controls. Mammary tumor incidence was determined over a ten month post-exposure period. None of the controls or the  $10^{10}$  proton animals died during this interval, while three percent of the  $4 \times 10^{10}$  proton group and 17 percent of the 400 R group did not survive this period. The incidence of rats with mammary neoplasia ranged from 5 percent in the controls, to 22 percent in the  $10^{10}$  proton group, to 50 percent in the  $4 \times 10^{10}$  proton group, to 79 percent in the 400 R group. Ovarian weights were depressed only in the 400 R group. Cataracts were found in 2 animals from the  $4 \times 10^{10}$  proton group and in one animal from the 400 R group. It appears, under the conditions of this experiment, that the neoplastic response to  $4 \times 10^{10}$  protons is approximately  $\frac{1}{4}$  to  $\frac{1}{2}$  as large as the response to 400 R.

The above results have been submitted to the Radiation Research Society for possible presentation at the annual meeting.

A second experiment was done, during October and November, in an attempt to find the L.D. 50% (30 days) for these protons. The exposures selected were not high enough, so that all that was learned was that  $1.1 \times 10^{11}$  was not a lethal exposure. It appears, then, that an exposure of  $10^{10}$  is a carcinogenic exposure and that this carcinogenic exposure can be detected when the exposure is no more than approximately 1/10 of the L.D. 50% exposure.

A third experiment was begun in February to test the interaction of 2.2 Gev protons and  $\text{Co}^{60}$  gamma exposure on mammary neoplasia in the rat. Two hundred R of gamma exposure was given with and without a  $4 \times 10^{10}$  proton exposure. The current (April 13, 1965) percent of exposed rats with mammary adenocarcinomas are: 200 R- $\text{Co}^{60}$ =3%;  $4 \times 10^{10}$  protons = 0; and 200 R + protons = 10%. It is too early to draw any conclusions about possible interactions.

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It is to be remembered that all exposures have been done at Brookhaven National Laboratory with follow-up studies done at the University of Michigan.